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spores were described as occurring with the teleuto form, but of the remaining three species only the latter stage was observed. In one of these, *D. læve*, S. & B., on *Manisurus granulis*, the author has recently discovered the uredo form, which he describes as occurring abundantly on both sides of the leaves. The sori are scattered and give to the surrounding parts a reddish or yellowish hue. The spores are roundish or ovate, 24–30μ in diameter, and are more or less spiny. Teleutospores of this species were very scarce. They are roundish or ovate, greatly enlarged at the apex and often somewhat concave. The author concludes his remarks on this genus by saying that it is certainly closely related to *Puccinia*, the only difference, so far known, being the position of the septum, which is never constant.

Following the foregoing observations are notes on a new variety of *Puccinia Schneideri*, Schrœt.; *Puccinia rubefaciens*, Johans.; *Puccinia silphii*, Schw.; *Puccinia Seymeriæ*, Burr.; *Puccinia ribis*, D. C.; *Puccinia oxyriæ*, Fckl.; *Uromyces Holwai, n. s.; Uredo arcticus, n. s.*, and *Cæoma nitens*, Schw.

Uromyces Holwai was collected at Ann Arbor, Mich., by Mr. E. W. D. Holway on *Lilium superbum*. Both the uredospores and teleutospores occur at the same time, appearing on both sides of the leaf. The Æcidium was not found. The uredospores are roundish, spiny, and are 20–26μ in diameter. The teleutospores resemble in every respect those of *U. erythronii*, (DC.), excepting that they are of a somewhat lighter color and have a thicker apex. In speaking of *Cæoma nitens* the author cites the opinion of several writers as to the probable connection of this fungus with other *Uredineæ* occurring upon *Rubus*, concluding his remarks by a reference to Allescher's paper, published in Bot. Centrablatt, No. 48, 1888, in which it is shown that the *Cæoma* is an isolated form.—B. T. GALLOWAY.

PLOWRIGHT, CHARLES R. *A Monograph of the British Uredineæ and Ustilagineæ.*

The appearance of this book was gladly welcomed by American botanists, although it does not deal with distinctively American species. It fills a need long felt by workers in this special field by combining in a convenient form the history, biology, morphology, classification, and economics of the rusts and smuts. The economic features are not directly treated in detail, but every portion abounds in notes and suggestions that can be applied to this phase of the subject, and the chapter on infection bears directly upon it.

The first part of the book comprises chapters on the biology, mycelium, spermogonia, æcidiospores, uredospores, teleutospores, and heterœcism of the *Uredineæ;* on the mycelium, formation of the teleutospores, and germination of the teleutospores of the *Ustilagineæ;* on infection of host plants by the *Ustilagineæ;* spore culture, and artificial infection of plants.

The object of the book, the author says, "is to obtain an insight into the life history and structure of the species of parasitic cryptogams occurring in Great Britain."

In the chapter on spermogonia considerable attention is paid to the attractions offered to insects by the saccharine qualities and odor of the spermogonia themselves and the bright color of the spots on which they are produced. A large number of experiments on the germination of spermatia were made, and the author succeeded in germinating the spermatia of the æcidia on *Bellis perennis*, *Ranunculus bulbosus*, *R. ficaria*, *Anemone coronaria*, *Lapsana communis*, and some others, but he did not succeed in infecting healthy plants. He discovered important differences between the budding spermatia and true yeast spores, in that the former did not produce alcohol. The function of the spermatia is discussed at some length, and the author concludes that the balance of evidence points to the conclusion that the spermatia are not sexual organs, but may possibly be conidia.

An important item in the chapter on æcidiospores is the fact that Plowright could not induce them to germinate after forty-eight hours, contrary to De Bary, who states that they retain their germinative faculty for some weeks.

Under Uredospores he notes the production of sporidia when the germ tube can not enter a stoma, and discusses the significance of paraphyses occurring with the uredospores. He considers them as morphologically analogous to the pseudo peridial cells of the æcidiospores, and says that when uredospores do not arise directly from the æcidiospores they are constantly present, but hardly present at all when the uredospores arise directly from the æcidiospores. He thinks that this indicates that they are an indication of exhaustion of vital energy, which is combated by protective efforts on the part of the fungus in preserving the spores it does produce.

Considerable space is devoted to the influence of barberry bushes on wheat and to the development of the knowledge of the heterœcism of the *Uredineæ.* The latest results on the subject are given in a tabular statement which may be summed up as follows: Forty-seven teleutospore forms have been connected with their corresponding æcidia. Of these Plowright himself has established the connection in eleven cases and verified it in twenty-seven others.

The *Ustilagineæ* are dealt with in essentially the same manner as the *Uredineæ.* After a short chapter on the mycelium, the author devotes a much longer one to spore formation, which he describes in detail for each genus. The chapter on germination includes descriptions of germination in all the different genera, together with fifteen species of *Ustilago*, five of *Urocystis* and three of *Entyloma.*

The chapter on Infection of Host Plants by the *Ustilagineæ* is devoted to discussing as to when and where the germ tubes of *Tilletia tritici* and *Ustilago segetum* enter the young plant; while this has been practically settled for the former, Plowright's experiments with the latter have only brought forth negative results. The chapter has a very practical application in that the decision of the question decides the best method to be followed in dressing seed to prevent smut. The fact that the question has been decided in case of bunt has enabled farmers to practically avoid it by a little exertion.

The chapters on spores culture and artificial infection of plants had perhaps been anticipated as eagerly as any by practical workers, and, while we could wish they had been longer, they are full of valuable suggestions.

The descriptions of species are full and accompanied by lists of synonyms, exsiccati, dates of appearance and disappearance, and biological notes. Plowright follows Winter in his method of citing authority. Where there is a double citation he retains the original authority in parentheses and omits the other. He has also followed Winter's classification, but has introduced the *Brachyuromyces* and *Brachypuccinia* to cover those forms having spermogonia, uredospores, and teleutospores. There are no *Uromyces* corresponding to this division, but the following *Puccinias* are included under it: *Puccinia suaveolens*, *P. bullata*, *P. hieracii*, *P. centaureæ*, and *P. taraxaci*. Winter places the first two under Hemipuccinia and includes *hieracii* and *taraxaci* under *P. flosculosorum*, one of the Antepuccinias.

In *Phragmidium* Plowright omits any subdivisions, but in *Melampsora* he departs entirely from Winter's arrangement and gives the following:

I. *Melampsora*. Teleutospores formed outside the epidermal cells of the host plant, and remaining single.

II. *Pucciniastrum*. Otth. Teleutospores formed outside the epidermal cells, becoming longitudinally or obliquely divided into from two to four cells.

III. *Thecopsora*. Magnus. Teleutospores formed in the epidermal cells, becoming confluent into irregular circumscribed masses. Uredospores in pustular heaps.

IV. *Melampsorella*. Schrœt. Teleutospores undivided, formed inside the epidermal cells (intracellular), hyaline, confluent in wide-spreading masses. Promycelial spores hyaline. Uredospores echinulate, inclosed in a pseudoperidium.

Coleosporium and *Chrysomyxa* are subdivided in the same manner as *Uromyces*.

There is a supplement containing a description of species of the related genera, *Graphiola*, *Entorrhiza*, *Tuberculina*, and *Protomyces*.

The book also contains a copy of the Massachusetts barberry law and a glossary, and is well indexed—E. A. SOUTHWORTH.